



International Union for conservation of Nature (IUCN)

**ALMURUNAH- Building Climate Resilience Through Enhance Water
Security in MENA**

Tender of

“Rehabilitation of Irrigation Canals in Wadi Seer”

Year of execution: 2024

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Natural Springs Rehabilitation

1. Rehabilitation of Al Deir Spring

Brief of Work

Rehabilitation work for Al-Deir Spring area like the Spring water tank (Manholes), and the outlet area which is available near the Asphalt Road, with consider the spring water shall be running and not stop the flow of water during all parts of rehabilitation works. The rehabilitation work includes the following:

- 1- Existing Manholes (two manholes): Carrying out and prepare the opening of existing manholes as followings:
 - a. Cut the existing ununiformed opening in the existing manholes (2 Manholes) with machine cutter (Grinder) by dimension equal to (75x75 cm)
 - b. Implemented a reinforced concrete squared upstand with clear opening of (75x75 cm) and height of (50 cm) and wall thick of 15cm, the works including installing a steel bar in the existing Manhole's slabs by using special material (such Epoxy) for bonding the steel bars with concrete slabs after drilling a hole (2 Rows) in staggered pattern and distance between bars equal 20cm in for each row
 - c. Supply and fix a heavy-duty steel cover
 - d. Supply and fix galvanized cat-ladder to facilitate the moving down inside the existing manholes, the steps and height as per specification and drawings.
- 2- Third location and opening near the Asphalt Road:
 - a. Up stand has to implemented with same as the above descriptions but the dimension shall be 90cmx140cm with height equal 50cm.
 - b. Supply and implemented grilles on the end of road slopes to carry the rainwater toward the stream path which located beside the road.

Technical specifications for concrete pipes

- The Jordanian standard specifications 289/1994 for cement pipes shall be adopted as general specifications for this tender, and what is stated in these specifications shall be applied to it, taking into consideration what is stated below.

- Laboratory tests are conducted in a laboratory approved by the supervising engineer, so that the contractor shall obtain written approval for the laboratory or laboratories in which the tests are to be conducted.
- Samples are taken after the pipes reach to the site and shall be taken from each diameter as follows to conduct tests: For all diameters, two pipes shall be tested, the test shall be conducted on the first pipe and the second pipe is in order to compare the dimensions and according to the engineer's instructions.
- The pipes shall be made of reinforced concrete with a separation connection and must meet the conditions and requirements of the Jordanian standard specifications (Article 1/289/1994) for Concrete pipes and are of the type of high-resistance pipes, Class I (A), a pipe with a separation connection, pipes shall succeed to appear the warranty load and the maximum load together upon inspection.
- The required pipes and their parts (Rings & Conic) shall be made of reinforced concrete and of the high-resistance pipes type, class I.
- The contractor is responsible for the age of the pipes when samples are taken for testing, as the age of the pipes when broken must not be less than (28) days from the date of casting these pipes.
- The contractor must take into consideration the following matters from the General Technical Specifications for Buildings of 1996, Volume One for Civil and Architectural Works:
 - Excavations: Item numbers:
 - (201, 202, 204/4, 204/6, 204/9, 204/10, 207/1, 207/2, 207/3, 207/4, 209/1)
 - Supporting and shoring the side of excavations: Item No. (211).
 - Scaffolding: Placing pedestrian passages in the places specified by the supervising engineer.
 - Site planning: Clause (106/1, 106/2, 106/4, 107/3).
 - Concrete works: Items Nos. (302/1, 302/2, 302/7, 304/8, 304/11, 305, 306, 307,
 - 308, 309/2/b, 311, 317, 320)
 - Installing and connecting pipes: Clause (1504/3, 1504/1).
- Installing a warning tape under the concrete layer, indicating the type and depth of the lines below the warning tape.
- The dimensions of the manholes are from the inside.
- When the height of the manhole's floor above the road surface exceeds 1.5 m, the manholes must be provided with a steel ladder fixed to the manhole, measuring every 20 cm, and the price is based on the linear meter of the pipes.
- The level of the bottom of the incoming pipe must be higher than the level of the bottom of the outgoing pipe by at least 5 cm (between the inlet and outlet pipes).
- The width of the excavation shall not be less than the outer diameter of the pipe + 30 cm (15 + 15 lenticulars), provided that consideration is given to the use of the appropriate excavator to view the section and to protect the edges of the asphalt after cutting from

being disturbed by the excavator used, the contractor must choose the appropriate bucket for the width of the excavation

- Spreading and rolling the asphalt is done using a mechanical spreader (finisher), These materials are sprayed using a mechanical sprinkler to distribute them homogeneously over the sections. It is prohibited to use the manual method of spraying according to the opinion of the supervising engineer.
- The slope of the lines must not be less than 0.5% for the main lines, and the supervising engineer has the right to decide according to reality what he deems appropriate
- The supervisory body or the owner has the right to request quality control samples for any part of the work and examine them in public works laboratories, the University of Science and Technology, or the Royal Scientific Society, at the contractor's expense and at any stage of the work.

Technical specifications for constructing manholes and grills

- This work includes rainwater drains and manholes made of reinforced concrete with the necessary covers and clamps. It is implemented according to the locations and dimensions on the drawings and the consultant instructions.
- Concrete: The concrete used shall be grade (25) with a strength of not less than (250) kg/cm².
- Reinforcing steel: The reinforcing steel must be a deformed steel and have a yield stress of not less than 280 N/mm².
- The contractor is obligated to implement a riser for the manholes (conic, rings) or pipes with a suitable diameter, regardless of the height level between manhole's ceiling and road surface, and these Risers will be included in the price of the manhole.
- The inner side of floor and walls of the manholes and Grills shall have smooth faces (FIAR FACE), class (A).
- The contractor is obligated to provide, supply and spread a graded aggregate (Base course) with a thickness of 20 cm at the bottom of the manholes and grills, according to the engineering drawings and at the bottom of the blinding concrete layer, so that the degree of compaction is not less than 95%.

Technical specifications for manhole & Grill cover

- Grill's covers and Frames shall be made of wrought steel, of plain sections (75x16mm) mm, and angles (80x80x8mm), according to the attached engineering drawings. A ring shall be provided for each cover, provided that the covers and rings shall be painted with bituminous primer paint, on both sides, before installation and according to the engineer's request.

- The required manhole covers shall be made of heavy duty cast iron, with the necessary rings also made of cast iron, and shall have a regular and acceptable external shape and be free of gaps and any other defects. One random sample shall be taken for test.
- These steel covers shall be delivered to the site coated with a bituminous-based layer, provided that this layer is smooth and consistent and not susceptible to runny nose or peeling when exposed to temperatures ranging between 0 and 63 degrees Celsius.
- Loading test: One random sample shall be taken in order to test it according to Specification No. (BS-479). The covers must pass the loading test and all covers must be able to bear the specified load, which is (350) KN for a period of not Less than half a minute.
- The size of the grill will be (100*60) cm from the inside and according to the drawings.

2. Rehabilitation of Tarabil Spring

Brief of Work.

Rehabilitation work for Tarabil Spring area like the Spring source, connection channels (after and before stream path), stream path, stream protect wall, channels below stream, with consider the spring water shall be running and not stop the flow of water during all parts of rehabilitation works. The rehabilitation work includes the following:

- Clean all spring area: the contractor shall remove all debris, excavated materials, slurry, Stones, unnecessary roots, obstacles, rubbles and excavation output which are not reusable by other works, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval.
- Demolishing and remove the concrete-channels which located after and before stream path as per drawing, Demolishing and removing the old concrete Channel, and rebuild a new reinforced concrete channel as per Designed Drawings and Specifications, the demolishing will be for the walls only if the foundation is in good condition, the foundation shall be keep for fixing and supporting the new channels that planned to implemented as per specifications and conditions.
- New channels: new channels shall execute in the same path of old channels and same existing levels; the execution of the new channels have to consider tow cases:
- First case: if the ground is retaining wall or concrete wall with good condition:

- The new channel shall execute at the top of these walls by erection steel rebar using an epoxy material and complete the work of channels concrete from foundation up to precast cover.
- Second case: if the ground is soil:
 - Excavation, Levelling, compaction, Base coarse and Blinding concrete shall be implemented before the channel's concrete works, with consideration of excavation levels up to design channels level.
- The channels which are located at below of stream flow, special design (concrete culvert) available for this area to protect the spring water from mixing with Stream water, and to absorb the shock from stream water, during flowing the water toward the new channel.
- Chain link fence required to carrying out on the top of existing retaining wall as per the location on the plan, to protect the human from fall down on the stream flow path, carrying out of Steel Fences (Chain link Fence) (Baklawas) above retaining wall as per drawings, including steel gate 3mX2.65m.
- Upstands (2 numbers) are required to construction in order to redirect the stream flow toward the correct flow direction as per plan,
- Retaining wall in front of stream flow: extended the retaining wall which is located at the front of Stream flow in order to prevent the water (during Flood) to leave the stream path toward the spring area and mixing with spring water.
- Manhole (80cmX80cm) at the connection channels with the road shall be implemented.

Work description

- Cleaning and levelling the ground of spring: the contractor is to remove all debris, excavated materials, rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval, and keep the site clean and Level as per Drawings.
- Demolishing and rebuild of spring old channels (at spring yard) which the path of channel has to be from Spring sources to the connection with the road as per the drawings, existing level have to be the design level for contractor, and the water flow should continue running throw all the duration of any work as proposed by contractor and approved by consultant, the work included the following:
 - Demolishing the existing channel in the spring yard for existing path of channels
 - Excavate of channel path and compaction the existing soil.
 - Install road base (150mm) thick with compaction degree (95%)
 - Casing blinding concrete (10 cm) with strength equal 200 kg/cm²
 - The channels inner and outer surfaces should be fair-face and smooth.

- Backfilling and levelling around the channels outer section as per drawings and consultant approved.
- The layers of as per the drawings.
- Manholes for Spring-water: one manhole by inner dimension of (0.8mx0.8m) should be implemented as per tender drawings and specification and conditions

Chain link steel Fence and steel gate

- supply and install Steel fence in two locations the first at spring yard including one steel gate, and the work contains the following article and the second on the top of soil nails wall (top of rock-cut):
- supply and install Steel fence with a clear height of 2.0m and the vertical pipe shall has embedded 50 cm inside footing underground level as per drawings and details.
- steel fence consisting of galvanized steel mesh (Baklawas) dimension of 4cmX4cm and 4 mm thickness, its surrounded with galvanized steel-pipes of diameter (2"), and the vertical galvanized steel-pipes of diameter (3") shall erect every 4 m with a top cap.
- The works including all accessories, plates and steel parts shown in the drawings and details.
- the work including all tools, machines, parts and materials which required to implemented a double-leaf door with width 3.0m and height 2.65m for Spring yard entrance according to the drawings and details, the work include the all screws, bolts, welding or any type of elements required to complete the work.
- All fence elements shall be full covered and painted by special layer to resist weather factors.
- The Locations for installation the steel fences are: first location is above the existing stone wall and the other is above the shoring wall of spring
- Part of vertical pipes shall be embedded amount (40cm) inside a reinforced footing, the dimensions of these footings are (40cmX40cm and depth of 50cm) and reinforcement steel is (Φ 12/12 cm).

Special Condition for Rehabilitation Springs & Channels:

- The contractor is to remove all debris, excavated materials, rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved

location as per directions by consultant supervisor/Engineer and Authorities approval, and to keep the site clean for channels works.

- Contractor shall provide surveyor full time during soil nails works and during any activity, to insure and determined the levels, coordinate alignment of rock cut, also to assign and mark the location of soil nails before drilling works. • The contractor shall provide all necessary equipment, Manpower, Tools, shutter, ... etc., which will be required to complete the works
- The contractor can provide a proposal for any works or any activities if he finds an alternative solution or alternative work procedures that will be easy and give the same Quality for the works with consider the specification terms, the approval for these proposals shall be for consultant Engineer.
- The contractor must maintain the continuity of the spring's water flow and channel's water flow during all stages of the work.
- The price for implementation a new channel is including the demolishing of the old channels, cleaning and removing all obstacle, excavation if required, backfilling, materials, tools, machine manpower and all the necessary that required to complete the works in the best quality, also contractor shall be keep running the flow of water fulltime during execution duration for all activities.
- The contractor shall Demolishing and Removing existing channels, and implement a new channel with location are the same existing Channels route, also using the current levels for existing channels as designed levels for the newly implemented channels route, also the contractor can use a new level for the new designed channels according to approval from the consultant engineer.
- Contractor shall supply and install a Steel gate (Control Gates) for the channels at many locations as per BOQ, the price will be included with the channels amount, and to be constructed according to be as per the existing gates, specifications and consultant instructions • It must be taken into consideration that the thickness and steel reinforcement of the channel's walls that adjacent to the earthen-cut or the mountain-cut must be greater than the thickness of the other channel's walls as per drawings and details, but for channels that located in place of no earthen-cut or no required backfilling near the channel's walls the thickness of these walls will be equal on both sides.
- Channels, collector water tank or other concrete elements the concrete cover (Steel Cover) is (5 cm-7.5cm) if the element contact directly with the soil, and (3cm) if the structure element not contact directly with soils.
- The contractor shall Obtain Necessary authorization for start-up and execution of works and this includes (but not limited to) all permits and approvals related to the use of land, permission to build and access, as well as all relevant governmental bodies authorization depending on the proposed project requirements and on the national law.
- the contractor shall submit Method statement for any activity as per consultant instructions such as method statement for soil nails wall, storm water drainage line, channels, etc.

- channel removal work shall be includes removing all components of the channel, according to the current section of the site. In the case of concrete sections for channel, Riprap, or flow of water through regular soil channels, two cases shall be considered:
 - In the case of reinforced concrete walls, Blocks, and reinforced concrete foundations, all walls must be removed, but the foundations can be kept and adopted as a basis for the new channels that are required to be constructed.
 - In the case of non-reinforced channels (earth or Riprap), all their components must be removed, the backing must be compacted after removal, all foundation layers must be installed, including base course and Blinding Concrete, and the foundations and walls of the new channels must be constructed according to the required Drawings and specifications.
- When constructing new channels and indicating the instability of the old Foundation due to the location of the channel on the slope of the mountainous area, the contractor must stabilize the old foundation and the ground on which it is required to be established before the work of constructing the new channels, by using a stone wall below the foundation area with steel mesh and shotcrete or any idea from contractor and after approval by consultant.
- If the channels are located on flat ground, the channels must be constructed with all their layers, as per drawings and design, including a base course layer and blinding concrete with all necessary works related to these activities.
- Carrying out plastering work for the damaged areas for the retaining walls that a new channel will be constructed above these retaining walls, and rested above these walls, the work includes the following:
 - Clean and wash the retaining wall section from soil, dirt and stones before carrying out the plastering work and remove the cleaning waste away from the site.
 - Carrying out plastering work for the retaining wall section, two coats of plaster shall apply with a mixture of sand, cement, including sea sand and an adhesive. The ratio of sand to cement is 1:4. The first side is rough, the plastering works including the final coat of smooth finish, the works included supply and apply of all required materials, water, curing three days, tools and machine.
- The dimensions are according to the drawing and the supervisor instructions.
- For any case of reinforced concrete which will contact direct to soil, Base Coarse (min. thick 15cm and MDD 95%) and Blinding concrete (10 cm) should be applied at the below of reinforced concrete as layers, if this mentioned in drawings or not.
- The contractor shall provide any required type of shutter (Formwork), including fair-face timber in order to complete the required works and as per consultant instructions.
- The contractor shall implement a concrete collector tank which should be connected directly with the Spring sources to collect all water that Coming from spring before flowing throw the channels.
- The contractor shall supply and install a Water-stop rubber (thick. 20-25cm) for any size of Concrete-collector-tank at any spring, the location of this rubber shall be in the contact

between foundation and vertical walls, first half width of this water-stop should embed in the foundation and the other half should have imbedded in the vertical walls.

- Dimension of Collector water tanks or channels for any springs shall as per drawings, and the compressive strength for these tanks are 250 kg/cm³, concrete slump 10cm, the contractor shall provide concrete cubes for compressive strength test using 15cmX15cm cubes, the number of cubes for any test shall be 6 cubes, the first 3 cubes for doing the test and take the average, and the Additional 3 cubes for spare in case of failing the first cube test we can use it to do the test again.
- Steel specifications are ASTM designation A-615 or equivalent, stress =4200 kg/cm², grade 60
- For any reinforced concrete works, plastering works, ... etc. the concrete has to be cured with water for three days two times a day, vibrator shall provide and use during casting a reinforced concrete.
- In case of segregation, it must be treated with special filler-expansion materials and according to the consultant instructions and approvals, the consultant can decide for treatment or demolishing (removing) the concrete structure and the contractor have to follow the instructions by removing this structure and redo the work.
- Wall and roof shutters should not be removed before 3 and 14 days after casting respectively.
- ready mix concrete is the allowed concrete for any part of reinforced concrete structure, the contractor shall submit mix design for consultant approvals, in special cases and conditions it is allowed to use onsite-mixing and manual casting, with consider the percentage of mix components during onsite-mixing. • The prices for all required materials, tools, shuttering, fixing steel, casting concrete, ...etc. are included in the unit prices unless it mentioned otherwise.
- The contractor shall provide a cover-block (Plastic or concrete) as required for channels, concrete water tank or other concrete elements, the concrete cover (Steel Cover) is (5 cm7.5cm) if the structure contact directly with the soil, and (3cm) if the structure not contact directly with soils.
- The levels which indicated in the drawings of spring's underground water tank are from Surveying work results, therefore, if required to change any level from these levels for any reason during the work conditions, the other related levels should be change also, to keep the constructions depth or high as same as before changing the origin level.
- The contractor shall implement a concrete collector tank with dimension 1.8X1.8m and height of 1.65m, the work shall include (but not limit to) all the necessary accessories, materials, tools equipment, etc. which required to accomplish all the activities.
- The contractor shall Excavate in all types of soil and rock according to drawings levels and dimensions and to the technical specifications. The work starts by clearing, grubbing of top soil as specified.

- For any concrete construction or sub-elements for any works in the tender such as collector tanks, manholes, Channels or etc., the contractor shall Excavate any type of soil or rock according to drawings dimensions and to the technical specifications.
- The contractor also for any kind of activity and according to the drawings and specifications, shall do an Cleaning and Levelling, remove all debris, excavated materials, Rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval, and keep the site clean and Level as per Drawings.

Technical specifications for constructing manholes and grills

- This work includes rainwater drains and manholes made of reinforced concrete with the necessary covers and clamps. It is implemented according to the locations and dimensions on the drawings and the consultant instructions.
- Concrete: The concrete used shall be grade (25) with a strength of not less than (250) kg/cm².
- Reinforcing steel: The reinforcing steel must be a deformed steel and have a yield stress of not less than 280 N/mm².
- The contractor is obligated to implement a riser for the manholes (conic, rings) or pipes with a suitable diameter, regardless of the height level between manhole's ceiling and road surface, and these Risers will be included in the price of the manhole.
- The inner side of floor and walls of the manholes and Grills shall have smooth faces (FIAR FACE), class (A).
- The contractor is obligated to provide, supply and spread a graded aggregate (Base course) with a thickness of 20 cm at the bottom of the manholes and grills, according to the engineering drawings and at the bottom of the blinding concrete layer, so that the degree of compaction is not less than 95%.

Technical specifications for manhole & Grill cover

- Grill's covers and Frames shall be made of wrought steel, of plain sections (75x16mm) mm, and angles (80x80x8mm), according to the attached engineering drawings. A ring shall be provided for each cover, provided that the covers and rings shall be painted with bituminous primer paint, on both sides, before installation and according to the engineer's request.

- The required manhole covers shall be made of heavy duty cast iron, with the necessary rings also made of cast iron, and shall have a regular and acceptable external shape and be free of gaps and any other defects. One random sample shall be taken for test.
- These steel covers shall be delivered to the site coated with a bituminous-based layer, provided that this layer is smooth and consistent and not susceptible to runny nose or peeling when exposed to temperatures ranging between 0 and 63 degrees Celsius.
- Loading test: One random sample shall be taken in order to test it according to Specification No. (BS-479). The covers must pass the loading test and all covers must be able to bear the specified load, which is (350) KN for a period of not Less than half a minute.
- The size of the grill will be (100*60) cm from the inside and according to the drawings.

Irrigation Canals Rehabilitation

3. Rehabilitation of Abu Al-Batayeh Canal

Brief of Work

- Rehabilitation work for Abu Al-Batayeh Canal, the work includes the following:

Rehabilitation Abu Al-Batayeh Canal Yard including the following:

- a. Demolishing and removing old concrete Canal, and rebuild a new reinforced concrete canal as per Designed Drawings and Specifications, the demolishing will be for the walls only if the foundation is in good condition, the foundation shall be kept for fixing and supporting the new canals-foundations that planned to implemented as per specifications and conditions.
- b. In case of implemented a new canal on soil base, the layers of base coarse 15cm and blinding concrete 10cm, with compaction for the base course and natural soil, the percentage of compaction shall be 95% for base course.
- c. The designed level for the new canals shall be same as the existing canals, and contractor has to take reading for the levels before demolishing the old canals in order to use these readings for implementation the new canal levels

- d. Supplying, installing and painting control gates (Slide Gates), containing from 4 mm thick sheet Plate, with dimensions as per existing or new canal dimensions (contractor shall follow the existing gates as a details for his fabrication and installation works), the works shall include all the necessary accessories, tools or any equipment, including also the frames that shall embedded inside concrete or fixing with bolts with concrete, the gates including installing a chain for each gate that is tied to the gate plates and frames, the operation of open and close are manually. These steel gates or control gate shall be installed at the required locations as per site conditions and consultant instructions.

Work description

Rehabilitation work for Abu Al-Batayeh Canal area such as demolishing existing canals and build a new canal, with consider the water of canal shall be running and not stop the flow of water during implementation of all parts of rehabilitation works. The rehabilitation works include the following:

- Contractor shall with consider the Canal water shall be running and not stop the flow of water during implementation of all parts of rehabilitation works
- Demolishing and rebuild of new canal and the work included the following:
 - a. If the new canal will be implemented on soil layer (nature layer):
 - Demolishing the existing canal for existing path.
 - Excavate of canal path and compaction the existing soil.
 - Install Base coarse (150mm) thick with compaction degree (95%)
 - Casing blinding concrete (10 cm) with strength equal 200 kg/cm² the canals inner and outer surfaces should be fair-face and smooth.
 - Backfilling and levelling around the canals outer section as per drawings and consultant approved.
 - b. If the new canal will be implemented on the existing foundation in case of the old canal is concrete canal:
 - During demolishing the old canal, both side wall shall be demolishing completely and the foundation shall be kept to be as hard base for foundation of a new canal.
 - Cleaning and removing all the demolishing materials offsite directly.
 - Steel bars shall be installed in the old foundation throw drilling and bonding by special materials like Epoxy the bars have to installed in Zigzag pattern and the distances between them will be not more than 40cm in one direction as per drawing and specifications.
 - Formwork shall provide and installed as per consultant instructions and approvals.
 - Concrete of Canal shall be not less than 250 kg/cm², and reinforcement steel grade 60 with yield strength 420N/mm² and with diameters as per drawings
 - Backfilling and levelling around the canals outer section as per drawings and consultant approved.

Control steel gate, slide gate for Canals

- Supply and install steel gates (control gates) inside the inner side of canals for controlling the flow of water inside the canals and towards the sub-canals.
- All steel elements shall be painted by special layer to resist weather factors.
- The canals components are steel frames and steel plate of 4mm thick. The frame shall be four sides bottom, top and two sides the half of upper side shall be free fix.
- The dimension of canal shall be compatible with the inner width of existing or new canals.
- Chains shall provide to tie the upper side of frame with the sliding gate.
- The contractor shall install the gates in a manner that prevents leakage around the gate and binding of the gates during normal operation.
- Surfaces of metal against which concrete will be placed shall be free from oil, grease, loose mill scale, loose paint, surface rust, and other debris or objectionable coatings.
- Anchor bolts, thimbles, and spigot frames shall be secured in true position within the concrete forms and maintained in alignment during concrete placement.
- Concrete surfaces against which flat frames or plates are to be installed shall be finished to provide a smooth and uniform contact surface.
- When a flat frame is installed against concrete, a layer of concrete mortar shall be placed between the gate frame and the concrete.
- When a gate is attached to a wall thimble, a mastic or resilient gasket shall be applied between the gate frame and the thimble in accordance with the recommendations of the gate manufacturer.
- Wall plates, sills, and pin brackets for radial gates shall be adjusted and fastened by grouting and bolting after the gates have been completely assembled in place.

Special Condition for Rehabilitation Springs & Canals:

- The contractor is to remove all debris, excavated materials, rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval, and to keep the site clean for canals works.
- Contractor shall provide surveyor full time during soil nails works and during any activity, to insure and determined the levels, coordinate alignment of rock cut, also to assign and mark the location of soil nails before drilling works.
- The contractor shall provide all necessary equipment, Manpower, Tools, shutter, ... etc., which will be required to complete the works
- The contractor can provide a proposal for any works or any activities if he finds an alternative solution or alternative work procedures that will be easy and give the same

Quality for the works with consider the specification terms, the approval for these proposals shall be for consultant Engineer.

- The contractor must maintain the continuity of the Canal's water flow and canal's water flow during all stages of the work.
- The price for implementation a new canal is including the demolishing of the old canals, cleaning and removing all obstacle, excavation if required, backfilling, materials, tools, machine manpower and all the necessary that required to complete the works in the best quality, also contractor shall be keep running the flow of water fulltime during execution duration for all activities.
- The contractor shall Demolishing and Removing existing canals, and implement a new canal with location are the same existing Canals route, also using the current levels for existing canals as designed levels for the newly implemented canals route, also the contractor can use a new level for the new designed canals according to approval from the consultant engineer.
- Contractor shall supply and install a Steel gate (Control Gates) for the canals at many locations as per BOQ, the price will be included with the canals amount, and to be constructed according to be as per the existing gates, specifications and consultant instructions
- It must be taken into consideration that the thickness and steel reinforcement of the canal's walls that adjacent to the earthen-cut or the mountain-cut must be greater than the thickness of the other canal's walls as per drawings and details, but for canals that located in place of no earthen-cut or no required backfilling near the canal's walls the thickness of these walls will be equal on both sides.
- Canals, collector water tank or other concrete elements the concrete cover (Steel Cover) is (5 cm-7.5cm) if the element contact directly with the soil, and (3cm) if the structure element not contact directly with soils.
- The contractor shall Obtain Necessary authorization for start-up and execution of works and this includes (but not limited to) all permits and approvals related to the use of land, permission to build and access, as well as all relevant governmental bodies authorization depending on the proposed project requirements and on the national law.
- the contractor shall submit Method statement for any activity as per consultant instructions such as method statement for soil nails wall, storm water drainage line, canals, etc.
- canal removal work shall be includes removing all components of the canal, according to the current section of the site. In the case of concrete sections for canal, Riprap, or flow of water through regular soil canals, two cases shall be considered:
 - In the case of reinforced concrete walls, Blocks, and reinforced concrete foundations, all walls must be removed, but the foundations can be kept and adopted as a basis for the new canals that are required to be constructed.
 - In the case of non-reinforced canals (earth or Riprap), all their components must be removed, the backing must be compacted after removal, all foundation layers must be installed, including base course and Blinding Concrete, and the

foundations and walls of the new canals must be constructed according to the required Drawings and specifications.

- When constructing new canals and indicating the instability of the old Foundation due to the location of the canal on the slope of the mountainous area, the contractor must stabilize the old foundation and the ground on which it is required to be established before the work of constructing the new canals, by using a stone wall below the foundation area with steel mesh and shotcrete or any idea from contractor and after approval by consultant.
- If the canals are located on flat ground, the canals must be constructed with all their layers, as per drawings and design, including a base course layer and blinding concrete with all necessary works related to these activities.
- Carrying out plastering work for the damaged areas for the retaining walls that a new canal will be constructed above these retaining walls, and rested above these walls, the work includes the following:
 - Clean and wash the retaining wall section from soil, dirt and stones before carrying out the plastering work and remove the cleaning waste away from the site.
 - Carrying out plastering work for the retaining wall section, two coats of plaster shall apply with a mixture of sand, cement, including sea sand and an adhesive. The ratio of sand to cement is 1:4. The first side is rough, the plastering works including the final coat of smooth finish, the works included supply and apply of all required materials, water, curing three days, tools and machine.
- The dimensions are according to the drawing and the supervisor instructions.
- For any case of reinforced concrete which will contact direct to soil, Base Coarse (min. thick 15cm and MDD 95%) and Blinding concrete (10 cm) should be applied at the below of reinforced concrete as layers, if this mentioned in drawings or not.
- The contractor shall provide any required type of shutter (Formwork), including fair-face timber in order to complete the required works and as per consultant instructions.
- The contractor shall implement a concrete collector tank which should be connected directly with the Canal sources to collect all water that Coming from Canal before flowing throw the canals.
- The contractor shall supply and install a Water-stop rubber (thick. 20-25cm) for any size of Concrete-collector-tank at any Canal, the location of this rubber shall be in the contact between foundation and vertical walls, first half width of this water-stop should embed in the foundation and the other half should have imbedded in the vertical walls.
- Dimension of Collector water tanks or canals for any Canals shall as per drawings, and the compressive strength for theses tanks are 250 kg/cm³, concrete slump 10cm, the contractor shall provide concrete cubes for compressive strength test using 15cmX15cm cubes, the number of cubes for any test shall be 6 cubes, the first 3 cubes for doing the test and take the average, and the Additional 3 cubes for spare in case of failing the first cube test we can use it to do the test again.
- Steel specifications are ASTM designation A-615 or equivalent, stress =4200 kg/cm², grade 60

- For any reinforced concrete works, plastering works, ... etc. the concrete has to be cured with water for three days two times a day, vibrator shall provide and use during casting a reinforced concrete.
- In case of segregation, it must be treated with special filler-expansion materials and according to the consultant instructions and approvals, the consultant can decide for treatment or demolishing (removing) the concrete structure and the contractor have to follow the instructions by removing this structure and redo the work.
- Wall and roof shutters should not be removed before 3 and 14 days after casting respectively.
- ready mix concrete is the allowed concrete for any part of reinforced concrete structure, the contractor shall submit mix design for consultant approvals, in special cases and conditions it is allowed to use onsite-mixing and manual casting, with consider the percentage of mix components during onsite-mixing. • The prices for all required materials, tools, shuttering, fixing steel, casting concrete, ...etc. are included in the unit prices unless it mentioned otherwise.
- The contractor shall provide a cover-block (Plastic or concrete) as required for canals, concrete water tank or other concrete elements, the concrete cover (Steel Cover) is (5 cm7.5cm) if the structure contact direct with the soil, and (3cm) if the structure not contact directly with soils.
- The levels which indicated in the drawings of Canal's underground water tank are from Surveying work results, therefore, if required to change any level from these levels for any reason during the work conditions, the other related levels should be change also, to keep the constructions depth or high as same as before changing the origin level.
- The contractor shall implement a concrete collector tank with dimension 1.8X1.8m and height of 1.65m, the work shall include (but not limit to) all the necessary accessories, materials, tools equipment, etc. which required to accomplish all the activities.
- The contractor shall Excavate in all types of soil and rock according to drawings levels and dimensions and to the technical specifications. The work starts by clearing, grubbing of top soil as specified.
- For any concrete construction or sub-elements for any works in the tender such as collector tanks, manholes, Canals or etc., the contractor shall Excavate any type of soil or rock according to drawings dimensions and to the technical specifications.
- The contractor also for any kind of activity and according to the drawings and specifications, shall do an Cleaning and Levelling, remove all debris, excavated materials, Rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval, and keep the site clean and Level as per Drawings.

4. Rehabilitation of Iraq Al Amir Canal

Brief of Work

Rehabilitation work for Iraq Al Amir Canal, the work includes the following:

Rehabilitation Iraq Al Amir yard including the following:

- a. Demolishing and removing old concrete Canal, and rebuild a new reinforced concrete canal as per Designed Drawings and Specifications, the demolishing will be for the walls only if the foundation is in good condition, the foundation shall be keep for fixing and supporting the new canals-foundations that planned to implemented as per specifications and conditions.
- b. In case of implemented a new canal on soil base, the layers of base coarse 15cm and blinding concrete 10cm, with compaction for the base course and natural soil, the percentage of compaction shall be 95% for base course.
- c. Execution Manholes with dimensions equal (80x80cm) and height 1.0m, to be use before and after crossing the canal with the existing road, as per Plan and as specifications, strength of concrete shall be not less than 250kg/cm² and steel of grade 60.
- d. The designed level for the new canals shall be same as the existing canals, and contractor has to take reading for the levels before demolishing the old canals in order to use these readings for implementation the new canal levels
- e. Supplying, installing and painting control gates (Slide Gates), containing from 4 mm thick sheet Plate, with dimensions as per existing or new canal dimensions (contractor shall follow the existing gates as a details for his fabrication and installation works), the works shall include all the necessary accessories, tools or any equipment, including also the frames that shall embedded inside concrete or fixing with bolts with concrete, the gates including installing a chain for each gate that is tied to the gate plates and frames, the operation of open and close are manually. These steel gates or control gate shall be installed at the required locations as per site conditions and consultant instructions.

Work description

Rehabilitation work for Iraq Al Amir Canal area such as demolishing existing canals and build a new canal, with consider the water of canal shall be running and not stop the flow of water during implementation of all parts of rehabilitation works. The rehabilitation works include the following:

- 1- Contractor shall with consider the Canal water shall be running and not stop the flow of water during implementation of all parts of rehabilitation works
- 2- Demolishing and rebuild of new canal and the work included the following:
 - a. If the new canal will be implemented on soil layer (nature layer):

- Demolishing the existing canal for existing path.
 - Excavate of canal path and compaction the existing soil.
 - Install Base course (150mm) thick with compaction degree (95%)
 - Casing blinding concrete (10 cm) with strength equal 200 kg/cm²
 - The canals inner and outer surfaces should be fair-face and smooth.
 - Backfilling and levelling around the canals outer section as per drawings and consultant approved.
- b. If the new canal will be implemented on the existing foundation in case of the old canal is concrete canal:
- During demolishing the old canal, both side wall shall be demolishing completely and the foundation shall be kept to be as hard base for foundation of a new canal.
 - Cleaning and removing all the demolishing materials offsite directly.
 - Steel bars shall be installed in the old foundation throw drilling and bonding by special materials like Epoxy the bars have to installed in Zigzag pattern and the distances between them will be not more than 40cm in one direction as per drawing and specifications.
 - Formwork shall provide and installed as per consultant instructions and approvals.
 - Concrete of Canal shall be not less than 250 kg/cm², and reinforcement steel grade 60 with yield strength 420N/mm² and with diameters as per drawings
 - Backfilling and levelling around the canals outer section as per drawings and consultant approved.

Control steel gate, slide gate for Canals

- 1- Supply and install steel gates (control gates) inside the inner side of canals for controlling the flow of water inside the canals and towards the sub-canals.
- 2- All steel elements shall be painted by special layer to resist weather factors.
- 3- The canals components are steel frames and steel plate of 4mm thick. The frame shall be four sides bottom, top and two sides the half of upper side shall be free fix.
- 4- The dimension of canal shall be compatible with the inner width of existing or new canals.
- 5- Chains shall provide to tie the upper side of frame with the sliding gate.
- 6- The contractor shall install the gates in a manner that prevents leakage around the gate and binding of the gates during normal operation.

- 7- Surfaces of metal against which concrete will be placed shall be free from oil, grease, loose mill scale, loose paint, surface rust, and other debris or objectionable coatings.
- 8- Anchor bolts, thimbles, and spigot frames shall be secured in true position within the concrete forms and maintained in alignment during concrete placement.
- 9- Concrete surfaces against which flat frames or plates are to be installed shall be finished to provide a smooth and uniform contact surface.
- 10- When a flat frame is installed against concrete, a layer of concrete mortar shall be placed between the gate frame and the concrete.
- 11- When a gate is attached to a wall thimble, a mastic or resilient gasket shall be applied between the gate
- 12- frame and the thimble in accordance with the recommendations of the gate manufacturer.
- 13- Wall plates, sills, and pin brackets for radial gates shall be adjusted and fastened by grouting and bolting after the gates have been completely assembled in place.

Special Condition for Rehabilitation Springs & Canals:

- The contractor is to remove all debris, excavated materials, rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval, and to keep the site clean for canals works.
- Contractor shall provide surveyor full time during soil nails works and during any activity, to insure and determined the levels, coordinate alignment of rock cut, also to assign and mark the location of soil nails before drilling works. • The contractor shall provide all necessary equipment, Manpower, Tools, shutter, ... etc., which will be required to complete the works
- The contractor can provide a proposal for any works or any activities if he finds an alternative solution or alternative work procedures that will be easy and give the same Quality for the works with consider the specification terms, the approval for these proposals shall be for consultant Engineer.
- The contractor must maintain the continuity of the Canal's water flow and canal's water flow during all stages of the work.
- The price for implementation a new canal is including the demolishing of the old canals, cleaning and removing all obstacle, excavation if required, backfilling, materials, tools, machine manpower and all the necessary that required to complete the works in the best quality, also contractor shall be keep running the flow of water fulltime during execution duration for all activities.
- The contractor shall Demolishing and Removing existing canals, and implement a new canal with location are the same existing Canals route, also using the current levels for

existing canals as designed levels for the newly implemented canals route, also the contractor can use a new level for the new designed canals according to approval from the consultant engineer.

- Contractor shall supply and install a Steel gate (Control Gates) for the canals at many locations as per BOQ, the price will be included with the canals amount, and to be constructed according to be as per the existing gates, specifications and consultant instructions
- It must be taken into consideration that the thickness and steel reinforcement of the canal's walls that adjacent to the earthen-cut or the mountain-cut must be greater than the thickness of the other canal's walls as per drawings and details, but for canals that located in place of no earthen-cut or no required backfilling near the canal's walls the thickness of these walls will be equal on both sides.
- Canals, collector water tank or other concrete elements the concrete cover (Steel Cover) is (5 cm-7.5cm) if the element contact directly with the soil, and (3cm) if the structure element not contact directly with soils.
- The contractor shall Obtain Necessary authorization for start-up and execution of works and this includes (but not limited to) all permits and approvals related to the use of land, permission to build and access, as well as all relevant governmental bodies authorization depending on the proposed project requirements and on the national law.
- the contractor shall submit Method statement for any activity as per consultant instructions such as method statement for soil nails wall, storm water drainage line, canals, etc.
- canal removal work shall be includes removing all components of the canal, according to the current section of the site. In the case of concrete sections for canal, Riprap, or flow of water through regular soil canals, two cases shall be considered:
 - In the case of reinforced concrete walls, Blocks, and reinforced concrete foundations, all walls must be removed, but the foundations can be kept and adopted as a basis for the new canals that are required to be constructed.
 - In the case of non-reinforced canals (earth or Riprap), all their components must be removed, the backing must be compacted after removal, all foundation layers must be installed, including base course and Blinding Concrete, and the foundations and walls of the new canals must be constructed according to the required Drawings and specifications.
- When constructing new canals and indicating the instability of the old Foundation due to the location of the canal on the slope of the mountainous area, the contractor must stabilize the old foundation and the ground on which it is required to be established before the work of constructing the new canals, by using a stone wall below the foundation area with steel mesh and shotcrete or any idea from contractor and after approval by consultant.
- If the canals are located on flat ground, the canals must be constructed with all their layers, as per drawings and design, including a base course layer and blinding concrete with all necessary works related to these activities.

Carrying out plastering work for the damaged areas for the retaining walls that a new canal will be constructed above these retaining walls, and rested above these walls, the work includes the following:

- Clean and wash the retaining wall section from soil, dirt and stones before carrying out the plastering work and remove the cleaning waste away from the site.
- Carrying out plastering work for the retaining wall section, two coats of plaster shall apply with a mixture of sand, cement, including sea sand and an adhesive. The ratio of sand to cement is 1:4. The first side is rough, the plastering works including the final coat of smooth finish, the works included supply and apply of all required materials, water, curing three days, tools and machine.
- The dimensions are according to the drawing and the supervisor instructions.
- For any case of reinforced concrete which will contact direct to soil, Base Coarse (min. thick 15cm and MDD 95%) and Blinding concrete (10 cm) should be applied at the below of reinforced concrete as layers, if this mentioned in drawings or not.
- The contractor shall provide any required type of shutter (Formwork), including fair-face timber in order to complete the required works and as per consultant instructions.
- The contractor shall implement a concrete collector tank which should be connected directly with the Canal sources to collect all water that Coming from Canal before flowing throw the canals.
- The contractor shall supply and install a Water-stop rubber (thick. 20-25cm) for any size of Concrete-collector-tank at any Canal, the location of this rubber shall be in the contact between foundation and vertical walls, first half width of this water-stop should embed in the foundation and the other half should have imbedded in the vertical walls.
- Dimension of Collector water tanks or canals for any Canals shall as per drawings, and the compressive strength for theses tanks are 250 kg/cm³, concrete slump 10cm, the contractor shall provide concrete cubes for compressive strength test using 15cmX15cm cubes, the number of cubes for any test shall be 6 cubes, the first 3 cubes for doing the test and take the average, and the Additional 3 cubes for spare in case of failing the first cube test we can use it to do the test again.
- Steel specifications are ASTM designation A-615 or equivalent, stress =4200 kg/cm², grade 60
- For any reinforced concrete works, plastering works, ... etc. the concrete has to be cured with water for three days two times a day, vibrator shall provide and use during casting a reinforced concrete.
- In case of segregation, it must be treated with special filler-expansion materials and according to the consultant instructions and approvals, the consultant can decide for treatment or demolishing (removing) the concrete structure and the contractor have to follow the instructions by removing this structure and redo the work.
- Wall and roof shutters should not be removed before 3 and 14 days after casting respectively.

ready mix concrete is the allowed concrete for any part of reinforced concrete structure, the contractor shall submit mix design for consultant approvals, in special cases and conditions it is allowed to use onsite-mixing and manual casting, with consider the percentage of mix components during onsite-mixing. • The prices for all required materials, tools, shuttering, fixing steel, casting concrete, ...etc. are included in the unit prices unless it mentioned otherwise.

- The contractor shall provide a cover-block (Plastic or concrete) as required for canals, concrete water tank or other concrete elements, the concrete cover (Steel Cover) is (5 cm7.5cm) if the structure contact directly with the soil, and (3cm) if the structure not contact directly with soils.
- The levels which indicated in the drawings of Canal's underground water tank are from Surveying work results, therefore, if required to change any level from these levels for any reason during the work conditions, the other related levels should be change also, to keep the constructions depth or high as same as before changing the origin level.
- The contractor shall implement a concrete collector tank with dimension 1.8X1.8m and height of 1.65m, the work shall include (but not limit to) all the necessary accessories, materials, tools equipment, etc. which required to accomplish all the activities.
- The contractor shall Excavate in all types of soil and rock according to drawings levels and dimensions and to the technical specifications. The work starts by clearing, grubbing of top soil as specified.
- For any concrete construction or sub-elements for any works in the tender such as collector tanks, manholes, Canals or etc., the contractor shall Excavate any type of soil or rock according to drawings dimensions and to the technical specifications.
- The contractor also for any kind of activity and according to the drawings and specifications, shall do an Cleaning and Levelling, remove all debris, excavated materials, Rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval, and keep the site clean and Level as per Drawings.

Manholes for Canal Water

The work contains the following article:

- The contractor must verify the road levels before starting the excavation work and bear responsibility for any errors in the engineering drawings, contractor have to submit a Shop Drawing (longitudinal sections with levels) and profile drawings before starting the work and obtain approval from the supervising engineer for all lines, profile plan shall be including existing and designed levels, distances between manholes, excavation depth, inlet and outlet level, slopes cumulative distance ... etc.

- The contractor has to submit proposals for how to connect the lines proposed in the bid with the old lines or with the culverts or the end of the lines, and written approval must be obtained from the supervising engineer before starting implementation work.
- Constructing Inspection Points (manholes) according to the engineering Drawings and the consultant engineer's instructions, so that the contractor shall use (Fair Face) class (A) Formwork, reinforce and pour concrete with a strength grade of not less than (250 kg/cm²) cubes after 28 days for the walls, ceilings and bases, and pour Concrete with a breaking strength of not less than 150 kg/cm² for Blinding Concrete under the base, with consider to use the vibrator while pouring reinforced concrete, and the contractor must curing the reinforced concrete for three days according to the engineer's instructions.
- Providing, supplying and installing manhole covers with Frames, such that they are made of heavy-duty cast iron, with a bearing strength of no less than (350 kN) and a diameter of (600) mm, a cover must be provided for each manhole with iron fingers.
- contractor shall write on the manhole cover the followings, as per drawings:
 - a. for rainwater manholes (canals water):
(Greater Amman Municipality/ Rainwater Drainage / 2024)
 - b. for Canal water manhole
(Ministry of Agriculture/ Iraq Al Amir Canal Water / 2024)
- The contractor must visit the various work sites and verify the nature of the soil and excavation levels. He is not entitled to modify prices during the implementation phase, regardless of the nature of the work.
- The contractor must coordinate with public institutions (electricity, communications, water, MPWH, ...etc.) to avoid causing any damage to these services. In the event of causing any damage to public services or citizens' property, the contractor must restore them to their correct conditions, and the contractor shall bear the expenses of restoring conditions and everything related. With the value of the damages and fines inflicted on the lines of the public institutions mentioned previously, and the contractor bears responsibility for removing, moving, or changing the levels of the service lines that obstruct the drainage line.
- The responsibility for removing obstacles, whatever their type, shall be on the contractor, as the contractor is obligated to review all relevant competent authorities, and the contractor is obligated not to claim any malfunction or damage resulting from these obstacles, no matter how great the damage.
- The contractor is obligated to Excavate to any depth, no matter how great and according to what the study needs, and he is not entitled to any financial claim resulting from the depths.
- Make side openings in the manholes where necessary and according to the engineer's instructions to connect branch lines in the future.
- The contractor must verify the street levels before starting the excavation work and bear responsibility for any errors in the engineering plans. He must submit an executive plan/ Shop Drawing (longitudinal sections with levels) and profile plans before starting

the work and obtain approval from the supervising engineer for all lines. The sites mentioned in the tender, whether they have engineering Drawings (longitudinal sections or Profile) attached to the tender or without Attached Drawings, Contractor must submit proposals for how to connect the lines proposed in the bid with the old lines or with the culverts or the end of the lines, and written approval must be obtained from the supervising engineer before starting implementation work.

- The passage of chain excavators on asphalt surfaces is prohibited unless there are rubber rollers or any alternatives approved in advance by the supervising engineer.
- After the excavation process, the contractor is obligated to provide safe bridges for pedestrians to cross every entrance to a house or building, or a bridge for every 3 commercial stores, according to population pressure.
- samples of Base Course layer, Concrete and Asphalt layers can be taken all at the contractor's expense, regardless of their frequency.

Technical specifications for constructing manholes and grills

- This work includes rainwater drains and manholes made of reinforced concrete with the necessary covers and clamps. It is implemented according to the locations and dimensions on the drawings and the consultant instructions.
- Concrete: The concrete used shall be grade (25) with a strength of not less than (250) kg/cm².
- Reinforcing steel: The reinforcing steel must be a deformed steel and have a yield stress of not less than 280 N/mm².
- The contractor is obligated to implement a riser for the manholes (conic, rings) or pipes with a suitable diameter, regardless of the height level between manhole's ceiling and road surface, and these Risers will be included in the price of the manhole.
- The inner side of floor and walls of the manholes and Grills shall have smooth faces (FIAR FACE), class (A).
- The contractor is obligated to provide, supply and spread a graded aggregate (Base course) with a thickness of 20 cm at the bottom of the manholes and grills, according to the engineering drawings and at the bottom of the blinding concrete layer, so that the degree of compaction is not less than 95%.

Technical specifications for manhole cover

- The required manhole covers shall be made of heavy duty cast iron, with the necessary rings also made of cast iron, and shall have a regular and acceptable external shape and be free of gaps and any other defects. One random sample shall be taken for test.

- These steel covers shall be delivered to the site coated with a bituminous-based layer, provided that this layer is smooth and consistent and not susceptible to runny nose or peeling when exposed to temperatures ranging between 0 and 63 degrees Celsius.
- Loading test: One random sample shall be taken in order to test it according to Specification No. (BS-479). The covers must pass the loading test and all covers must be able to bear the specified load, which is (350) KN for a period of not Less than half a minute.
- The size of the grill will be (100*60) cm from the inside and according to the drawings.

5. Rehabilitation of Qasr Al-Amir Canal

Brief of Work

Rehabilitation work for Qasr Al-Amir Canal, the work includes the following:

Rehabilitation Qasr Al-Amir Canal Yard including the following:

- a. Demolishing and removing old concrete Canal, and rebuild a new reinforced concrete canal as per Designed Drawings and Specifications, the demolishing will be for the walls only if the foundation is in good condition, the foundation shall be kept for fixing and supporting the new canals-foundations that planned to implemented as per specifications and conditions.
- b. In case of implemented a new canal on soil base, the layers of base coarse 15cm and blinding concrete 10cm, with compaction for the base course and natural soil, the percentage of compaction shall be 95% for base course.
- c. The designed level for the new canals shall be same as the existing canals, and contractor has to take reading for the levels before demolishing the old canals in order to use these readings for implementation the new canal levels
- d. Supplying, installing and painting control gates (Slide Gates), containing from 4 mm thick sheet Plate, with dimensions as per existing or new canal dimensions (contractor shall follow the existing gates as a details for his fabrication and installation works), the works shall include all the necessary accessories, tools or any equipment, including also the frames that shall embedded inside concrete or fixing with bolts with concrete, the gates including installing a chain for each gate that is tied to the gate plates and frames, the operation of open and close are manually. These steel gates or control gate shall be installed at the required locations as per site conditions and consultant instructions.

Work description

Rehabilitation work for Qasr Al-Amir Canal area such as demolishing existing canals and build a new canal, with consider the water of canal shall be running and not stop the flow of water during implementation of all parts of rehabilitation works. The rehabilitation works include the following:

- Contractor shall with consider the Canal water shall be running and not stop the flow of water during implementation of all parts of rehabilitation works
- Demolishing and rebuild of new canal and the work included the following:
 - a. If the new canal will be implemented on soil layer (nature layer):
 - Demolishing the existing canal for existing path.
 - Excavate of canal path and compaction the existing soil.
 - Install Base course (150mm) thick with compaction degree (95%)
 - Casing blinding concrete (10 cm) with strength equal 200 kg/cm²
 - The canals inner and outer surfaces should be fair-face and smooth.
 - Backfilling and levelling around the canals outer section as per drawings and consultant approved.
 - b. If the new canal will be implemented on the existing foundation in case of the old canal is concrete canal:
 - During demolishing the old canal, both side wall shall be demolishing completely and the foundation shall be kept to be as hard base for foundation of a new canal.
 - Cleaning and removing all the demolishing materials offsite directly.
 - Steel bars shall be installed in the old foundation throw drilling and bonding by special materials like Epoxy the bars have to installed in Zigzag pattern and the distances between them will be not more than 40cm in one direction as per drawing and specifications.
 - Formwork shall provide and installed as per consultant instructions and approvals.
 - Concrete of Canal shall be not less than 250 kg/cm², and reinforcement steel grade 60 with yield strength 420N/mm² and with diameters as per drawings
 - Backfilling and levelling around the canals outer section as per drawings and consultant approved.

Control steel gate, slide gate for Canals

- Supply and install steel gates (control gates) inside the inner side of canals for controlling the flow of water inside the canals and towards the sub-canals.
- All steel elements shall be painted by special layer to resist weather factors.

- The canals components are steel frames and steel plate of 4mm thick. The frame shall be four sides bottom, top and two sides the half of upper side shall be free fix.
- The dimension of canal shall be compatible with the inner width of existing or new canals.
- Chains shall provide to tie the upper side of frame with the sliding gate.
- The contractor shall install the gates in a manner that prevents leakage around the gate and binding of the gates during normal operation.
- Surfaces of metal against which concrete will be placed shall be free from oil, grease, loose mill scale, loose paint, surface rust, and other debris or objectionable coatings.
- Anchor bolts, thimbles, and spigot frames shall be secured in true position within the concrete forms and maintained in alignment during concrete placement.
- Concrete surfaces against which flat frames or plates are to be installed shall be finished to provide a smooth and uniform contact surface.
- When a flat frame is installed against concrete, a layer of concrete mortar shall be placed between the gate frame and the concrete.
- When a gate is attached to a wall thimble, a mastic or resilient gasket shall be applied between the gate
- frame and the thimble in accordance with the recommendations of the gate manufacturer.
- Wall plates, sills, and pin brackets for radial gates shall be adjusted and fastened by grouting and bolting after the gates have been completely assembled in place.

Special Condition for Rehabilitation Springs & Canals:

- The contractor is to remove all debris, excavated materials, rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval, and to keep the site clean for canals works.
Contractor shall provide surveyor full time during soil nails works and during any activity, to insure and determined the levels, coordinate alignment of rock cut, also to assign and mark the location of soil nails before drilling works.
- The contractor shall provide all necessary equipment, Manpower, Tools, shutter, ... etc., which will be required to complete the works
- The contractor can provide a proposal for any works or any activities if he finds an alternative solution or alternative work procedures that will be easy and give the same Quality for the works with consider the specification terms, the approval for these proposals shall be for consultant Engineer.
- The contractor must maintain the continuity of the Canal's water flow and canal's water flow during all stages of the work.
- The price for implementation a new canal is including the demolishing of the old canals, cleaning and removing all obstacle, excavation if required, backfilling, materials, tools,

machine manpower and all the necessary that required to complete the works in the best quality, also contractor shall be keep running the flow of water fulltime during execution duration for all activities.

- The contractor shall Demolishing and Removing existing canals, and implement a new canal with location are the same existing Canals route, also using the current levels for existing canals as designed levels for the newly implemented canals route, also the contractor can use a new level for the new designed canals according to approval from the consultant engineer.
- Contractor shall supply and install a Steel gate (Control Gates) for the canals at many locations as per BOQ, the price will be included with the canals amount, and to be constructed according to be as per the existing gates, specifications and consultant instructions
- It must be taken into consideration that the thickness and steel reinforcement of the canal's walls that adjacent to the earthen-cut or the mountain-cut must be greater than the thickness of the other canal's walls as per drawings and details, but for canals that located in place of no earthen-cut or no required backfilling near the canal's walls the thickness of these walls will be equal on both sides.
- Canals, collector water tank or other concrete elements the concrete cover (Steel Cover) is (5 cm-7.5cm) if the element contact directly with the soil, and (3cm) if the structure element not contact directly with soils.
- The contractor shall Obtain Necessary authorization for start-up and execution of works and this includes (but not limited to) all permits and approvals related to the use of land, permission to build and access, as well as all relevant governmental bodies authorization depending on the proposed project requirements and on the national law.
- the contractor shall submit Method statement for any activity as per consultant instructions such as method statement for soil nails wall, storm water drainage line, canals, etc.
canal removal work shall be includes removing all components of the canal, according to the current section of the site. In the case of concrete sections for canal, Riprap, or flow of water through regular soil canals, two cases shall be considered:
 - In the case of reinforced concrete walls, Blocks, and reinforced concrete foundations, all walls must be removed, but the foundations can be kept and adopted as a basis for the new canals that are required to be constructed.
 - In the case of non-reinforced canals (earth or Riprap), all their components must be removed, the backing must be compacted after removal, all foundation layers must be installed, including base course and Blinding Concrete, and the foundations and walls of the new canals must be constructed according to the required Drawings and specifications.
- When constructing new canals and indicating the instability of the old Foundation due to the location of the canal on the slope of the mountainous area, the contractor must stabilize the old foundation and the ground on which it is required to be established before the work of

constructing the new canals, by using a stone wall below the foundation area with steel mesh and shotcrete or any idea from contractor and after approval by consultant.

- If the canals are located on flat ground, the canals must be constructed with all their layers, as per drawings and design, including a base course layer and blinding concrete with all necessary works related to these activities.
- Carrying out plastering work for the damaged areas for the retaining walls that a new canal will be constructed above these retaining walls, and rested above these walls, the work includes the following:
 - Clean and wash the retaining wall section from soil, dirt and stones before carrying out the plastering work and remove the cleaning waste away from the site.
 - Carrying out plastering work for the retaining wall section, two coats of plaster shall apply with a mixture of sand, cement, including sea sand and an adhesive. The ratio of sand to cement is 1:4. The first side is rough, the plastering works including the final coat of smooth finish, the works included supply and apply of all required materials, water, curing three days, tools and machine.
- The dimensions are according to the drawing and the supervisor instructions.
- For any case of reinforced concrete which will contact direct to soil, Base Coarse (min. thick 15cm and MDD 95%) and Blinding concrete (10 cm) should be applied at the below of reinforced concrete as layers, if this mentioned in drawings or not.
- The contractor shall provide any required type of shutter (Formwork), including fair-face timber in order to complete the required works and as per consultant instructions.
- The contractor shall implement a concrete collector tank which should be connected directly with the Canal sources to collect all water that Coming from Canal before flowing throw the canals.
- The contractor shall supply and install a Water-stop rubber (thick. 20-25cm) for any size of Concrete-collector-tank at any Canal, the location of this rubber shall be in the contact between foundation and vertical walls, first half width of this water-stop should embed in the foundation and the other half should have imbedded in the vertical walls.

Dimension of Collector water tanks or canals for any Canals shall as per drawings, and the compressive strength for theses tanks are 250 kg/cm³, concrete slump 10cm, the contractor shall provide concrete cubes for compressive strength test using 15cmX15cm cubes, the number of cubes for any test shall be 6 cubes, the first 3 cubes for doing the test and take the average, and the Additional 3 cubes for spare in case of failing the first cube test we can use it to do the test again.
- Steel specifications are ASTM designation A-615 or equivalent, stress =4200 kg/cm², grade 60
- For any reinforced concrete works, plastering works, ... etc. the concrete has to be cured with water for three days two times a day, vibrator shall provide and use during casting a reinforced concrete.
- In case of segregation, it must be treated with special filler-expansion materials and according to the consultant instructions and approvals, the consultant can decide for

treatment or demolishing (removing) the concrete structure and the contractor have to follow the instructions by removing this structure and redo the work.

- Wall and roof shutters should not be removed before 3 and 14 days after casting respectively.
- ready mix concrete is the allowed concrete for any part of reinforced concrete structure, the contractor shall submit mix design for consultant approvals, in special cases and conditions it is allowed to use onsite-mixing and manual casting, with consider the percentage of mix components during onsite-mixing.
- The prices for all required materials, tools, shuttering, fixing steel, casting concrete, ...etc. are included in the unit prices unless it mentioned otherwise.
- The contractor shall provide a cover-block (Plastic or concrete) as required for canals, concrete water tank or other concrete elements, the concrete cover (Steel Cover) is (5 cm7.5cm) if the structure contact directly with the soil, and (3cm) if the structure not contact directly with soils.
- The levels which indicated in the drawings of Canal's underground water tank are from Surveying work results, therefore, if required to change any level from these levels for any reason during the work conditions, the other related levels should be change also, to keep the constructions depth or high as same as before changing the origin level.
- The contractor shall implement a concrete collector tank with dimension 1.8X1.8m and height of 1.65m, the work shall include (but not limit to) all the necessary accessories, materials, tools equipment, etc. which required to accomplish all the activities.
- The contractor shall Excavate in all types of soil and rock according to drawings levels and dimensions and to the technical specifications. The work starts by clearing, grubbing of top soil as specified.
- For any concrete construction or sub-elements for any works in the tender such as collector tanks, manholes, Canals or etc., the contractor shall Excavate any type of soil or rock according to drawings dimensions and to the technical specifications.

The contractor also for any kind of activity and according to the drawings and specifications, shall do an Cleaning and Levelling, remove all debris, excavated materials, Rocks boulders, Stones, unnecessary roots, Grass, obstacles, rubbles, excavation output which are not reusable by other works and any obstacles listed or not listed in contract, off site to an approved location as per directions by consultant supervisor/Engineer and Authorities approval, and keep the site clean and Level as per Drawings.

